SUBDIVISION OF LOT 1-A-12-A-1
OF LAND COURT APPLICATION 834
PRELIMINARY SOIL EXPLORATION REPORT

KALIHI, HONOLULU, OAHU, HAWAII
TAX MAP KEY: 1-4-13: 11

To:
PARK ENGINEERING, INCORPORATED

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

AUGUST 8, 1972

WALTER LUM ASSOCIATES, INC.
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August 8, 1972

PARK ENGINEERING, INC.
1149 Bethel Street, Room 710
Honolulu, Hawaii 96813

Gentlemen:

Subject: Subdivision of Lot 1-A-12-A-1
of Land Court Application 834
Preliminary Soil Exploration Report
Kalihi, Honolulu, Oahu, Hawaii
Tax Map Key: 1-4-13: 11

Transmitted herewith is our preliminary soil exploration report for the proposed Subdivision of Lot 1-A-12-A-1 of Land Court Application 834 in Kalihi, Honolulu, Oahu, Hawaii.

This report includes a Boring Location Plan, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

CR/EK:rmf

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SUBDIVISION OF LOT 1-A-12-A-1
OF LAND COURT APPLICATION 834
PRELIMINARY SOIL EXPLORATION REPORT

KALIHI, HONOLULU, OAHU, HAWAII
TAX MAP KEY: 1-4-13: 11

SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions for residential development for the proposed Subdivision of Lot 1-A-12-A-1 of Land Court Application 834 in Kalihi, Honolulu, Oahu, Hawaii.

This report includes field explorations, laboratory tests and general recommendations and limitations for site grading and residential foundation design.

FIELD EXPLORATION

Two exploratory borings were made and an exposed cut slope was logged. The locations of the borings and logged slope are shown on the Boring Location Plan. Descriptions of the soils encountered are shown on the boring logs.

The borings were made with 3 and 4-in. augers using a tungsten carbide drag bit. Soil samples were recovered with 2-in. diameter thin-wall tube samplers and a standard split spoon sampler driven with a 140-lb hammer falling 30 inches.

LABORATORY TESTS

Laboratory tests included: natural water content and density, unconfined compression, Atterberg limit and grain-size analysis.

A summary of the laboratory test results is given in Tables IA and IB.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GENERAL SITE DESCRIPTION

The site is located between Likelike Highway and Kalihi Valley Road about midway between Iwao Place and Huea Place.

The site generally slopes down from Likelike Highway toward Kalihi Valley Road at about 20 to 25% overall slopes. In localized areas, cut slopes of 50 to 100% have been made along Kalihi Valley Road and along a natural drainageway that runs along the eastern boundary of the site. There is also an existing drainageway that meanders along the west boundary.

The site is covered with trees, vines and brush. The ground generally appears moist. Moss growth on the trees and ground may be noted, particularly near the existing drainageways.

There is an existing house near the low central part of the site. The house is on a bench that was cut into the sidehill with nearly vertical walls about 15 ft high.

There are existing houses and retaining walls on the lots along the eastern boundary generally at elevations higher than this site.

Rainfall in the area is about 100 inches per year.

INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soils at the site may be generally described as follows:

Medium to stiff clayey silt, "MH", (decomposed rock) to about 25 to 30 ft, the depths drilled.

Water (or drill water?) was noted at about 11 and 22-ft depths in the borings during the field explorations.

For more detailed descriptions of soils encountered in the drill holes, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

The proposed plan is to grade the site and install an access road into the site from Kalihi Valley Road. Grading of the site will generally involve mostly cuts and some shallow fills.

Storm drainage culverts will replace the open channel along the eastern boundary where the natural drainageway crosses the site. A concrete lined ditch will be installed along the southern section of the western boundary.

Local fills are proposed generally for grading in the vicinity of the existing natural drainageways. Some fills are also planned alongside the proposed access roadway in the vicinity of the existing house in the southeast corner of the site.

Site Grading

Because some houses and walls are located near the boundaries of the site, particularly the east side, clearing, grubbing, grading and house building should be done with care to avoid disturbing the existing buildings and structures.

Some underpinning and support of slopes may be required depending upon how the Contractor does his work.

Before fills are constructed in the natural drainageway, the soft materials at the bottoms of the ditches should be stripped. Subdrains should be placed along the bottom to provide drainage.

Fairly well-graded granular soils should be used to construct the lower portions of fills in the drainageways, particularly along toes of slopes.

Grading work should generally be done as required by the Revised Ordinances of Honolulu, 1961 As Amended and as recommended below:

1. The area should be cleared and grubbed. Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling.

2. Loose surface and stockpiled soils should be stripped to stiff natural ground before the placement of fills. Loose surface soils at finish grade should be scarified and recompacted.

3. Localized soft pockets encountered during the site preparations should be excavated and backfilled with compacted select material.

4. Hard surfaces of existing roads should be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

5. Thin sidehill fills (sliver fills) on sloping areas should be avoided.

6. Where fills are proposed on sloping areas and in drainageways, loose material at the bottom and sides should be stripped down to

stiff natural ground before the placement of fills. New fills should be keyed into the stiff natural ground.

7. Where fills are proposed in natural drainageways or gullies, trenches should be cut in a herring-bone pattern along the bottom and sides before the placement of fills. Subdrains should be placed in the trenches. The locations of subdrains should be determined in the field after clearing and grubbing.

8. Fills should be constructed in approximately level layers starting at the lower end and working upward. Where fills are made on sloping areas steeper than about 5 horizontal to 1 vertical, the ground at the toe of the fill should be benched to a generally level condition. As the fill is brought up, it should continually be keyed into stiff natural ground by cutting steps into the slopes and compacting the fill into these steps.

9. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.

10. Provisions should be included to drain the site during and after filling operations.

Slopes

Because the existing site is fairly steep, a fairly high cut is planned along the Likelike Highway (north) side for site development. General guidelines for the design of this slope follow:

The top of slope should be kept as far away from the Likelike Highway boundary as practicable.

Surface water should be diverted away from the top of slope using lined swales to minimize erosion and possible slumping of the slope.

The height of slope, top to toe, should be kept less than about 40 to 45 ft.

Slope ratios of 2 horizontal to 1 vertical or flatter should be used.

Eight-ft wide benches should be placed at intervals less than 20-ft vertical height.

A partially cut and fill slope is planned alongside the access roadway. Slope ratios of 2 horizontal to 1 vertical or flatter

are recommended. The slope, toe to top, should generally be kept less than 20 ft in height. If practicable, the fill sections should be constructed by filling and compacting beyond the theoretical slope, then trimming and shaping the slope to the design lines and grades.

To minimize erosion, the runoff from rainstorms should be diverted away from slopes by berms or ditches whenever practicable.

Slope planting is recommended on cut and fill slopes to minimize erosion.

Slope adjustments or other precautions may be necessary if seepage zones, expansive soil pockets or soft spots are encountered in localized areas.

Should any cut be made below the natural ground water table, the slope should be over-excavated and replaced with a buttress fill of granular material. This situation will have to be worked out as the excavation progresses out in the field.

Foundations

House foundations should generally be of the post-and-beam type construction that can be releveled should settlements occur.

Masonry walls should be used with care and be designed to tolerate some surface creep or movement.

Soft spots or pockets of loose material encountered in footing excavations or below the building area should be excavated and replaced with well-graded granular material such as S4C or other approved material.

Because of the downhill creep effect of soils on a slope, some settlements may occur near the tops of slopes.

Buildings should generally be placed about 15 ft from the tops of slopes. This distance may be reduced for lower slope heights, e.g., 10 ft for 10-ft high slopes, but generally not closer than 5 ft from the top of any slope.

Construction of retaining walls on slopes should generally be avoided.

Good surface drainage away from the foundations of structures should be maintained and the site should be graded to prevent the ponding of water.

Roadway

In general, an estimate of the roadway pavement thickness for the light automobile traffic anticipated is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course.
3. Subbase course - 6-in. select borrow subbase course over a prepared subgrade.

Provisions should be made in the contract documents to allow for local adjustments regarding select borrow subbase and borrow material requirements in the field in accordance with the design standards of the City and County of Honolulu. In fill areas, the use of select soils within the top 2 to 3 ft of the subgrade may reduce the thickness of or eliminate the need for the select borrow subbase or borrow courses.

The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade levels thru the walls of the catch basins which are placed in these low areas.

Utilities

Utilities should be placed after the fills are constructed. Utility lines should be designed with flexible joints, particularly where lines are connected to structures.

Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots, seepage water or expansive soil pockets may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

Site Regrading

After mass grading work is done and cuts and fills are made according to the grading plans, regrading at some future date should be avoided unless done under the guidance of a Soils Engineer.

BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or sieve analysis test results.

KALIHI UKA

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log KALIHI-UKA LOT

PROJECT (FOR MR. MEW)

LOCATION KALIHI-UKA, OAHU, HAWAII

TAX MAP KEY: 1-4-13:11

BORING NO. 1 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date MAY 15, 1972

Field Party GLORY, MAKAULA, RADOVICH

Type of Boring AUGER (MOBILE B-50) Diam. 4"

Elev. 452' ± * Datum —

Drill Bit T.C. DRAG

HAMMER:
Weight 140#
Drop 30"
SAMPLER: 2" SS. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

		DRILL WATER?			
Water Level	11.0' ←				
Time	—				
Date	5-18-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 452' ± *	0									
MH	STIFF, MOTTLED REDDISH BROWN CLAYEY SILT		2"SS	1-A	-	60 LL = 101 PL = 66	-	-	-		
(MH)	MOTTLED BROWN & GRAY CLAYEY SILT	5	2"S	1-B	107	52 54	70	1690	-		3/0.5' 4/0.5'
	DRILL WATER ? 5-18-72										
		10	2"SS	1-C	-	55 LL = 55 PL = 44	-	-	-		
(SM)	MEDIUM DENSITY MOTTLED BROWN & GRAY SILTY SAND W/TRACES OF DECOMPOSED ROCK										
		15	2"S	1-D	119	52	78	1410	-		2/0.5' 4/0.5'
(SM)	LOOSE TO MEDIUM DENSITY, MOTTLED BROWN & GRAY SILTY SAND	20								2/0.5'	
			2"SS	1-E	-	60 31	-	-	-	16/0.5'	
	DENSE, GRAY-BROWN SILTY SAND & DECOMPOSED ROCK										
	ROCK	25	2"SS	1-F	-	NO RECOVERY			-		20/0.0' HAMMER BOUNCES
	END OF BORING @ 26'										

*ELEVATION ESTIMATED FROM GRADING PLAN

KALIHI UKA

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log KALIHI - UKA LOT

PROJECT (FOR MR. MEW)

LOCATION KALIHI-UKA, OAHU, HAWAII

TAX MAP KEY: 1-4-13:11

HAMMER:

Weight 12# SLEDGE HAMMER

Drop —

SAMPLER: 2" O.D. THIN WALL TUBE

LOG OF ~~BORING~~ SLOPE NO. 1A Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date MAY 15, 1972

Field Party GLORY, MAKAULA, RADOVICH

Type of Boring LOG OF SLOPE Diam. —

Elev. 490'± * Datum —

Drill Bit —

Water Level	NOT NOTICED				
Time	—				
Date	5-15-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	12 POUND SLEDGE HAMMER BLOWS/0.5'
	ELEV. = 490'± *?	0									
(MH)	DARK BROWN CLAYEY SILT W/ROOTS			1A-A	81	46	56	–	–		3/0.5' 5/0.5'
		5		1A-B	93	49	63	–	–		10/0.5' 6/0.0'
MH	DARK BROWN CLAYEY SILT W/DECOMPOSED ROCK										
		10		1A-C	87	76	50	4080	–		4/0.5' 8/0.5'
						LL= 97 PL= 69					
		15		1A-D	84	64	51	–	–		6/0.5' 6/0.5'
(MH)	TAN/RED, CLAYEY SILT W/DECOMPOSED ROCK	20		1A-E	97	56	62	4920	–		8/0.5' 10/0.5'
		25		1A-F	93	48	63	–	–		5/0.5' 9/0.5'
MH	DARK BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK					LL= 92 PL= 58					
		30		1A-G	107	52	71	4500	–		9/0.5' 10/0.5'
	BOTTOM OF SLOPE @ 31'										
	*ELEVATION ESTIMATED FROM GRADING PLAN										

KALIHI - UKA

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log KALIHI-UKA LOT (FOR MR. MEW)

PROJECT (FOR MR. MEW)

LOCATION KALIHI-UKA, OAHU, HAWAII

TAX MAP KEY: 1-4-13:11

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2"S - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 2 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date MAY 18, 1972

Field Party GLORY, RADOVICH, TANOUYE

Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"

Elev. 512' ± * Datum —

Drill Bit T.C. DRAG

Water Level	22.0' ←	DRILL WATER?			
Time	—				
Date	5-18-72				

Unified Soil Classification	DESCRIPTION ELEV. = 512' ± *?	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
(MH)	MEDIUM, BROWN CLAYEY SILT W/ROOTS	0	2"S	2-A	–	39 41 45	–	–	–		2/0.5 5/0.5
	DECOMPOSED ROCK (CRUSHES TO CLAYEY SILT)										
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT & DECOMPOSED ROCK	5	2"SS	2-B	–	61 63	–	–	–		
(MH)	MOTTLED BROWN, GRAY & ORANGE CLAYEY SILT W/ DECOMPOSED ROCK	10	2"S	2-C	106	57	68	–	–		5/0.5 7/0.5
MH	STIFF, MOTTLED BROWN CLAYEY SILT W/GRAY & YELLOW, CLAY POCKETS	15	2"SS	2-D	–	54 61 LL = 90 PL = 47	–	–	–		
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT & DECOMPOSED ROCK	20	2"S	2-E	–	59 43 49	–	–	–		4/0.5 6/0.5
	DRILL WATER? 5-18-72										
(MH)	STIFF, MOTTLED BROWN & GRAY, CLAYEY SILT W/ DECOMPOSED ROCK	25									
MH	STIFF, MOTTLED RED-BROWN CLAYEY SILT		2"SS	2-F	–	76 96 LL = 108 PL = 57	–	–	–		
	END OF BORING @ 26.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN

KALIHI-UKA LOT (FOR MR. MEW)

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	1	1	1A	1A
SAMPLE NO.	A	C	C	F
DEPTH BELOW SURFACE	1'-2.5'	10'-11.5'	10'-11'	25'-26'
DESCRIPTION	MOTTLED REDDISH-BROWN CLAYEY SILT	MOTTLED BROWN & GRAY SILTY SAND W/TRACES OF DECOMP. ROCK	DARK BROWN CLAYEY SILT W/DECOMP. ROCK	DARK BROWN CLAYEY SILT W/TRACES OF DECOMP. ROCK
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"		100		
1/2"		100		
#4		98.7		
#10		96.5		
#20		93.2		
#40		89.2		
#100		61.8		
#200		49.1		
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	101	55	97	92
Plastic Limit	66	44	69	58
Plasticity Index	35	11	28	34
Dilatancy	QUICK	QUICK	QUICK	QUICK
Toughness	SLIGHT-MED.	SLIGHT-MED.	SLIGHT-MED.	SLIGHT-MED.
Dry Strength	SLIGHT-MED.	SLIGHT-MED.	SLIGHT-MED.	SLIGHT-MED.
UNIFIED SOIL CLASSIFICATION	MH	SM	MH	MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 5-30-72 By BT

KALIHI-UKA LOT (FOR MR. MEW)

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	2	2		
SAMPLE NO.	D (BOT.)	F (BOT.)		
DEPTH BELOW SURFACE	15'-16.5'	25'-26.5'		
DESCRIPTION	MOTTLED BROWN CLAYEY SILT W/GRAY & YELLOW CLAY POCKETS	MOTTLED RED-BROWN CLAYEY SILT		
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL		
Liquid Limit	90	108		
Plastic Limit	47	57		
Plasticity Index	43	51		
Dilatancy	NONE-SLOW	MED.-QUICK		
Toughness	MED.-HIGH	MED.-HIGH		
Dry Strength	MEDIUM	MEDIUM		
UNIFIED SOIL CLASSIFICATION	MH	MH		
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

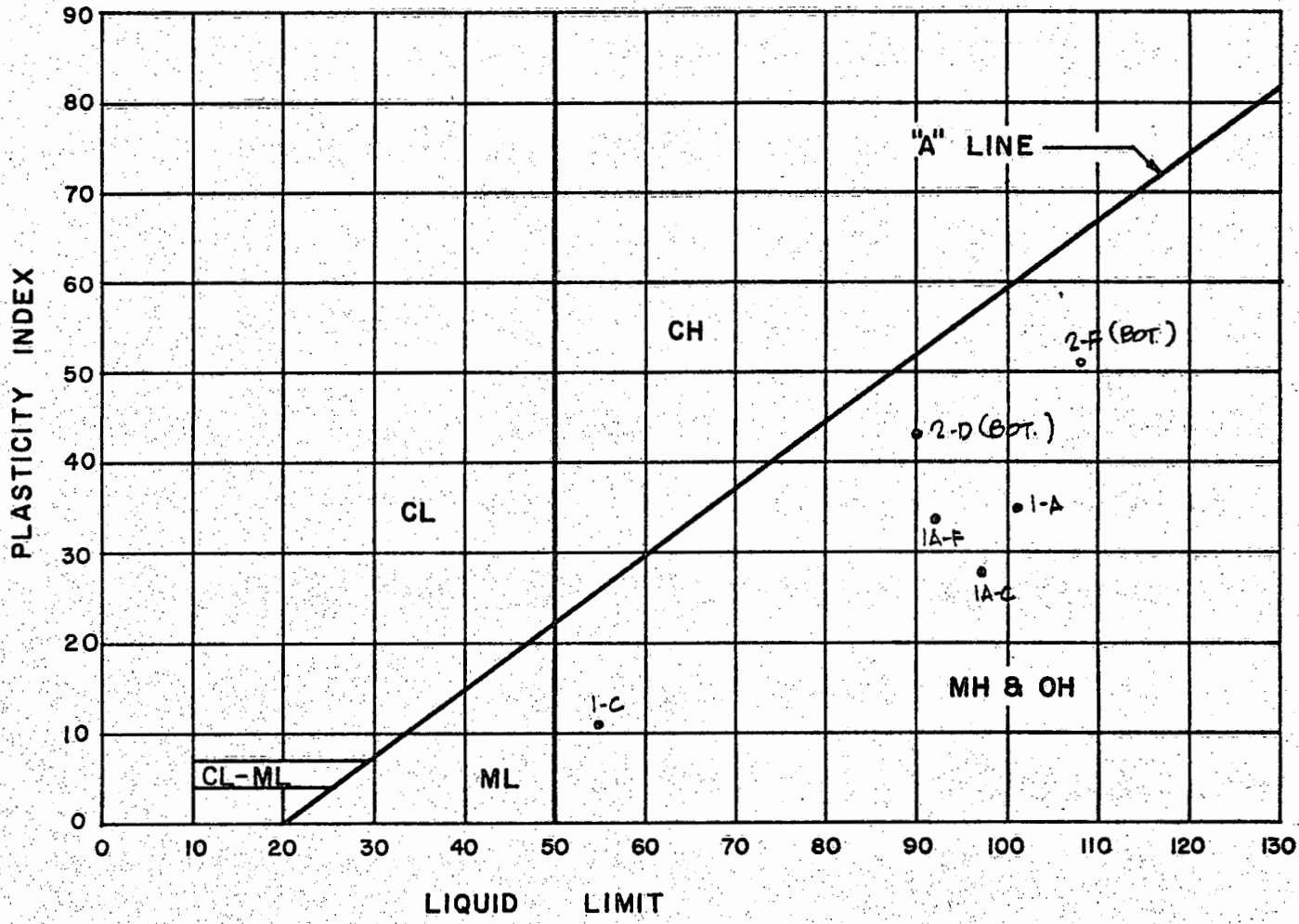
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 5-30-72 By BT

PLASTICITY CHART

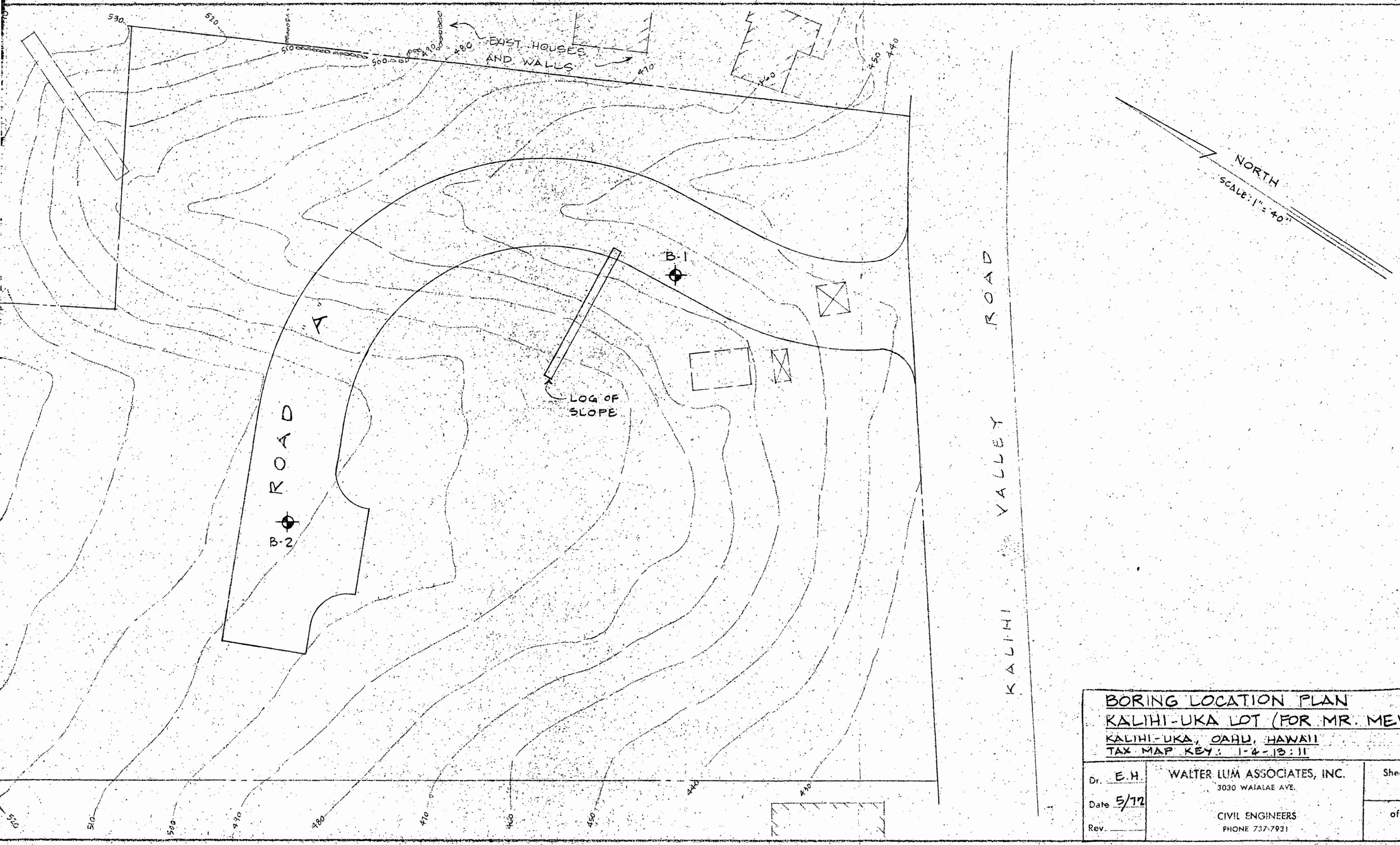
PROJECT: KALIHI-UKA LOT (FOR MR. MEW)

LOCATION: KALIHI-UKA , OAHU, HAWAII



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 5-30-72 BY B.T



BORING LOCATION PLAN
KALIHI-UKA LOT (FOR MR. MEW)

KALIHI-UKA, OAHU, HAWAII
TAX MAP KEY: 1-4-13:11

Dr. E.H.	WALTER LUM ASSOCIATES, INC.	Sheet
Date 5/72	3030 WAIALAE AVE.	
Rev.	CIVIL ENGINEERS	of
	PHONE 737-7931	

LIKELIKE HIGHWAY

550

540

530

520

510

500

490

480

470

460

450

440

430

ROAD "A"

B-2

B-1

LOCA OF SLOPE

EXIST HOUSES AND WALLS

KALIHI VALLEY ROAD

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse and the changed conditions.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.